October 28, 2003

8-1 Energy Efficiency & Conservation in Transportation

運輸部門の省エネルギー政策

Mr. Satoshi OSHIMA
大島　聡

Chief of Section
Environment Division
Policy Bureau
Ministry of Land, Infrastructure and Transport

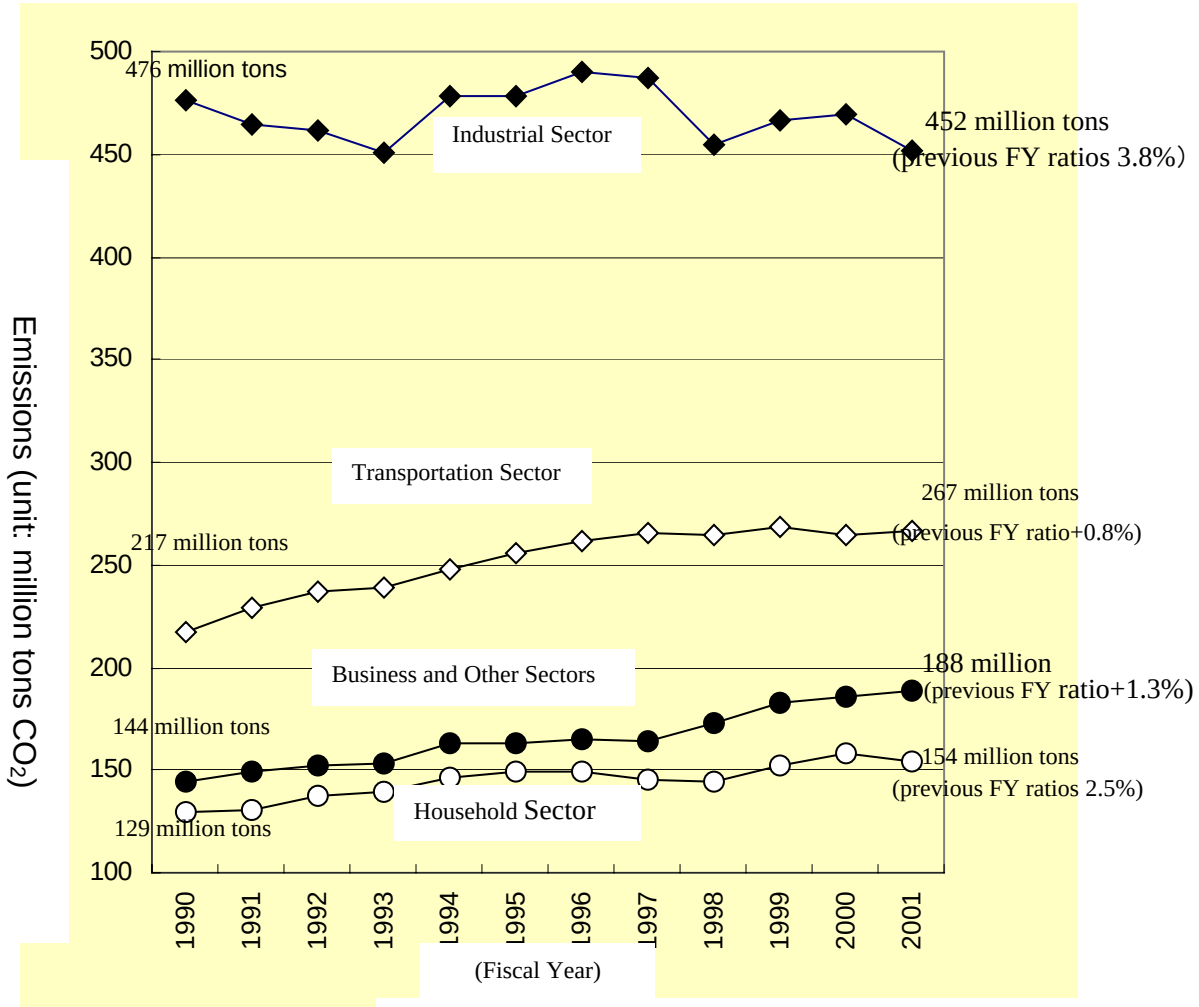
国土交通省
総合政策局　環境・海洋課
地球温暖化対策係長

Greenhouse Gas Emissions in FY2001

●Total greenhouse gas emissions in FY2001 was 1.299 billion tons※.
●This figure is a 2.5 percent reduction from FY2000.
●However, it is a 5.2 percent increase in total greenhouse gas emissions from the base year (1990) as set forth in the Kyoto Protocol Treaty.

Of this total figure for greenhouse gas emissions, 90 percent was comprised of carbon dioxide, which can be broken down according to the following sectors.

＜Industrial Sector＞	FY1990 ratio－ 5.1%
＜Transportation Sector＞	FY1990 ratio ＋22.8%
＜Business and Other Sectors＞	FY1990 ratio ＋30.9%
＜Household Sector＞	FY1990 ratio ＋19.4%



※This figure may be revised in future due to changes in the computation method.

September 12, 2003

Transitions in Carbon Dioxide Emissions and Transportation Volume According to Transportation Facilities

The ratio of carbon dioxide emissions produced by the transportation sector in Japan is about 20 percent, of which nearly 90 percent of this ratio is due to automobile emissions (see Fig. 1, Fig. 2). Carbon dioxide emissions produced by the transportation sector in FY2001 was about 267 million tons, an increase of approximately 49 million tons of CO_2 (about 23 percent) from FY1990 (see Fig. 1). The targeted carbon dioxide emissions for the transportation sector in FY2010 is about 250 million tons, which keeps the ratio of CO_2 increase at the FY1990 level of 17 percent, but the 23 percent increase registered in FY2001 has surpassed the 6 percent target. However, when it is compared to the emissions ratio for FY1998, the increase in the emissions ratio for FY2001 has remained at about 2 million tons- CO_2 (about 1 percent of emissions for FY1990). This is indicative of the effectiveness of the emissions control system in recent years.

CO_2 emissions produced by the passenger transportation sector showed an increase of about 47 million tons- CO_2 (41.8 percent) from FY1990 to FY2001. The rise in emissions from private cars was especially high[1].

In contrast, the growth in the emissions ratio for the overall cargo sector was less than the rise in the emissions ratio for the passenger transportation sector. It was about 2 million tons- CO_2 in FY1990 (2.0 percent increase); and it has tended to decrease especially after 1996. The trend according to transportation facility has been explained below.

Passenger Transportation Sector

The CO_2 emissions ratio of private cars increased according to the FY1990 ratio of 51.9 percent (4.7 percent/year). Although the growth rate was 44.6 percent from FY1990 to FY1998 (5.6 percent/year), it has remained at 5.0 percent (1.7 percent/year) from FY1998 to FY2001. This is indicative of the effective spread of fuel-efficient, low-emission cars due to the enactment of the auto tax to reduce fuel consumption (see Fig. 4).

The CO_2 basic emissions rate per mileage unit for private cars in FY2001 had deteriorated 3.1 percent from FY1990 emission levels, but improvement was seen after FY1998 (see Fig. 5

[1] Private buses and trucks have been excluded from the passenger transportation sector.

Correlation to Gas Mileage). Emission levels had improved by 4.1 percent in FY2001 from FY1998 levels.

The driving mileage of private cars increased by 47.4 percent, in contrast to FY1990 levels, and the transport volume increased by 32.3 percent (see Fig. 4). In addition to the growth in transport volume due to a rise in private cars, increased emission levels are linked to the fact that driving mileage has risen above the transport volume stemming from the drop in the number of people transported per car (see Fig. 6).

In contrast to the increased transport volume of private passenger cars and the rise in driving mileage, the transport volume has decreased for passenger railway lines and commercial buses (see Fig. 7). The transport share for this type of overland public transportation in FY2001 was 29.4 percent for railways and 5.3 percent for commercial buses—a drop of 4.8 points and 1.5 points, respectively (see Fig. 8). As a result, the CO_2 emissions level of the public transportation sector has either leveled off or decreased. But, in order to control the emissions level for the entire transportation sector, an urgent issue is to control the driving mileage of private cars by promoting the use of public transportation.

Cargo Sector

The emissions volume of trucks in FY2001 increased by 1.3 percent over emissions levels in FY1990. Since the driving mileage of trucks has only increased 0.7 percent[2], the increase in emissions volume per driving mileage unit has been nominal (see Fig. 9). However, since the transport volume per driving mileage unit (ton-kilo/vehicle kilo; average freight volume) has grown (see Fig. 10), the growth in emissions has remained low in comparison to the growth in transport volume (14.2 percent). This indicates that the energy efficiency of overall truck transport has improved. In particular, emissions have decreased (4.0 percent in FY 1998) in contrast to the growth in transport volume (4.1 percent in FY1998) after FY1998, which is indicative of improved energy efficiency in truck transport in recent years.

A review of the transition in trucks from private to commercial use shows that the transport volume ratio for commercial trucks for the entire cargo transport volume of trucks was 70.8 percent in FY1990, but rose to 83.0 percent in FY2001 (see Fig. 11). In addition, although the average freight volume for both private and commercial trucks has decreased, the overall

[2] Includes the driving mileage of private trucks used for transporting passengers

average freight volume has risen with the increased ratio of commercial trucks (see Fig. 10). Although the maximum freight volume for commercial trucks has tended to increase, the freight volume per truck has decreased slightly due to a drop in load efficiency (freight volume/maximum freight volume) (see Fig. 12). In FY2001, the difference in the basic freight volume unit was about 800g- CO_2/ton-kilo between private and commercial trucks. Since the total volume of cargo truck transport was about 300 billion ton-kilos, CO_2 emissions were reduced by approximately 2.4 million tons when one percent of cargo transport is shifted from private to commercial trucks.

A comparison of the cargo transport share for FY2001 and FY1990 shows a large growth in business trucks in FY2001, in contrast to a decrease in both railway and domestic ships. The transport share was 3.8 percent for railways and 42.1 percent for domestic ships in FY2001, a drop by 1.2 points and 2.6 points, respectively from FY1999 (see Fig. 13). Based on the above and in view of the tendency for trucks to switch from private to commercial operations, the emissions ratio of trucks showed an overall increase. The cargo transport share for domestic ships showed a tendency to increase after FY1999, despite a drop from 44.7 percent in FY1990 to 42.1 percent in FY2001 (see Fig. 14). The cargo transport share for railways has been decreasing uniformly, but railroad containers have remained at the same levels.

Transitions in Transport Volume and CO_2 Emissions According to Transportation Facilities

(Tables and Figures)

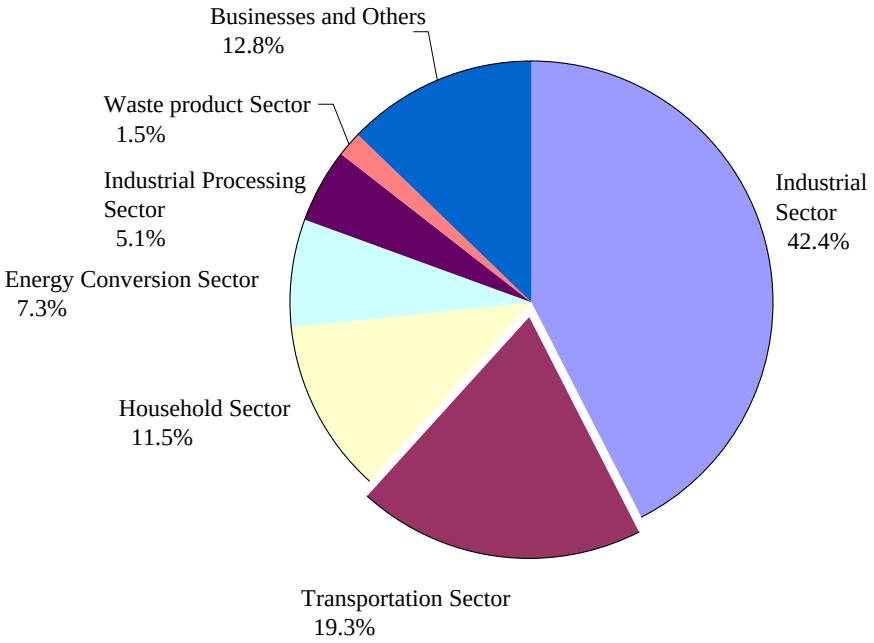
Table 1 CO_2 Emissions Volume of Each Transport Facility From FY1990 to FY2001

CO_2 (million tons)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Private Car	85.8	92.8	99.2	102.1	107.0	111.7	116.8	120.6	124.1	128.2	126.8	130.4
Taxi (commercial)	5.0	5.1	5.0	5.0	5.0	5.0	4.9	4.9	4.8	4.8	4.8	4.7
Bus (private)	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.9	0.8	0.8
Bus (commercial)	3.8	3.7	3.8	3.9	3.9	4.0	4.0	4.0	4.0	4.0	3.9	3.9
Railway Lines (passengers)	7.1	7.3	7.3	7.0	7.4	7.2	7.0	6.8	6.5	6.7	6.8	6.7
Shipping Lines (passenger)	4.7	5.1	5.0	5.3	5.2	5.5	6.0	7.1	5.6	5.5	5.5	4.9
Airlines (passenger)	5.9	6.5	7.0	7.3	7.7	8.6	8.5	9.1	9.1	9.0	9.0	9.2
Passengers	113.3	121.6	128.4	131.5	137.2	142.9	148.1	153.4	155.0	159.0	157.7	160.7
Private cargo	60.0	60.9	60.9	59.8	60.1	60.1	59.3	57.4	55.9	54.7	52.4	51.2
Commercial cargo	33.4	36.0	36.8	37.3	40.1	41.3	43.0	43.3	42.7	43.7	43.0	43.5
Railway Lines (cargo)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Shipping Lines	8.7	8.8	8.7	8.3	8.7	8.9	9.3	9.1	8.8	8.9	9.2	9.4
Airlines	1.2	1.3	1.3	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.5
Cargo	103.8	107.3	108.2	107.1	110.8	112.4	113.5	111.8	109.4	109.3	106.6	105.9
Total	217	229	237	239	248	255	262	265	264	268	264	267

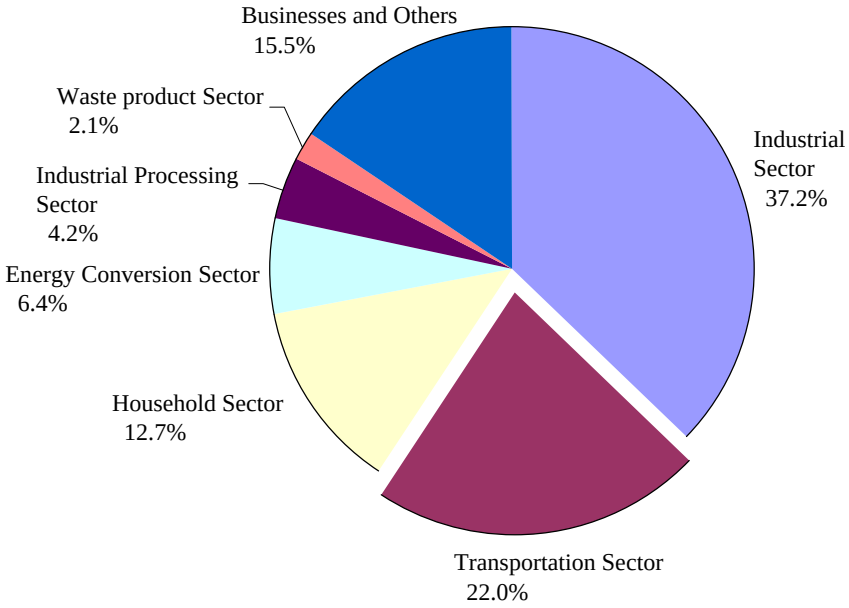
Table 2 Trend in Countermeasures Against Global Warming

May 1992	Adopt Framework Convention on Climate Change
March 1994	Framework Convention on Climate Change becomes effective
December 1997	Signing of the Kyoto Protocol [Treaty]
June 1998	Passed the general principles on accelerating countermeasures against global warning (former version)
June 1998	Revised the Rationalization in Energy Law (resolution on leading runner standard)
March 2001	Passed new general principles on accelerating countermeasures against global warning
April 2001	Implemented the auto tax plan to reduce fuel consumption
June 2002	Ratified the Kyoto Protocol [Treaty]

Fig. 1 Ratio of CO_2 Emissions According to Sector from FY1990 to FY2001

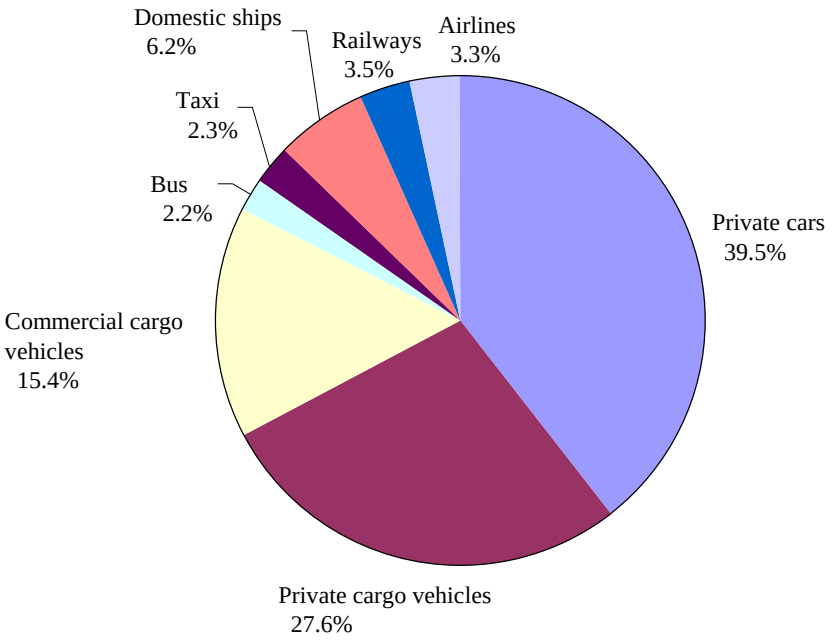


FY1990

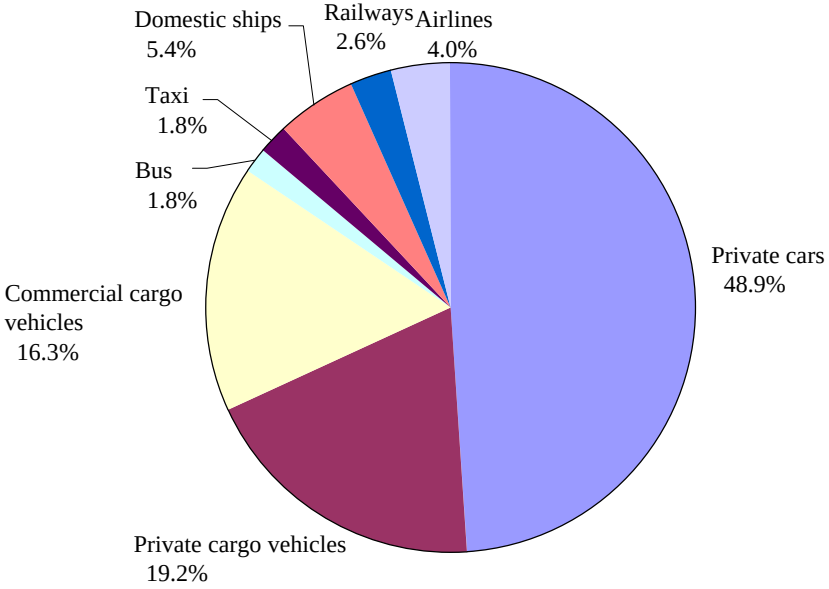


FY2001

Fig. 2 Ratio of Emissions According to Transportation Facility from FY1990 to FY2001



FY1990



FY2001

Fig. 3 Ratio of CO_2 Emissions According to Transportation Facility

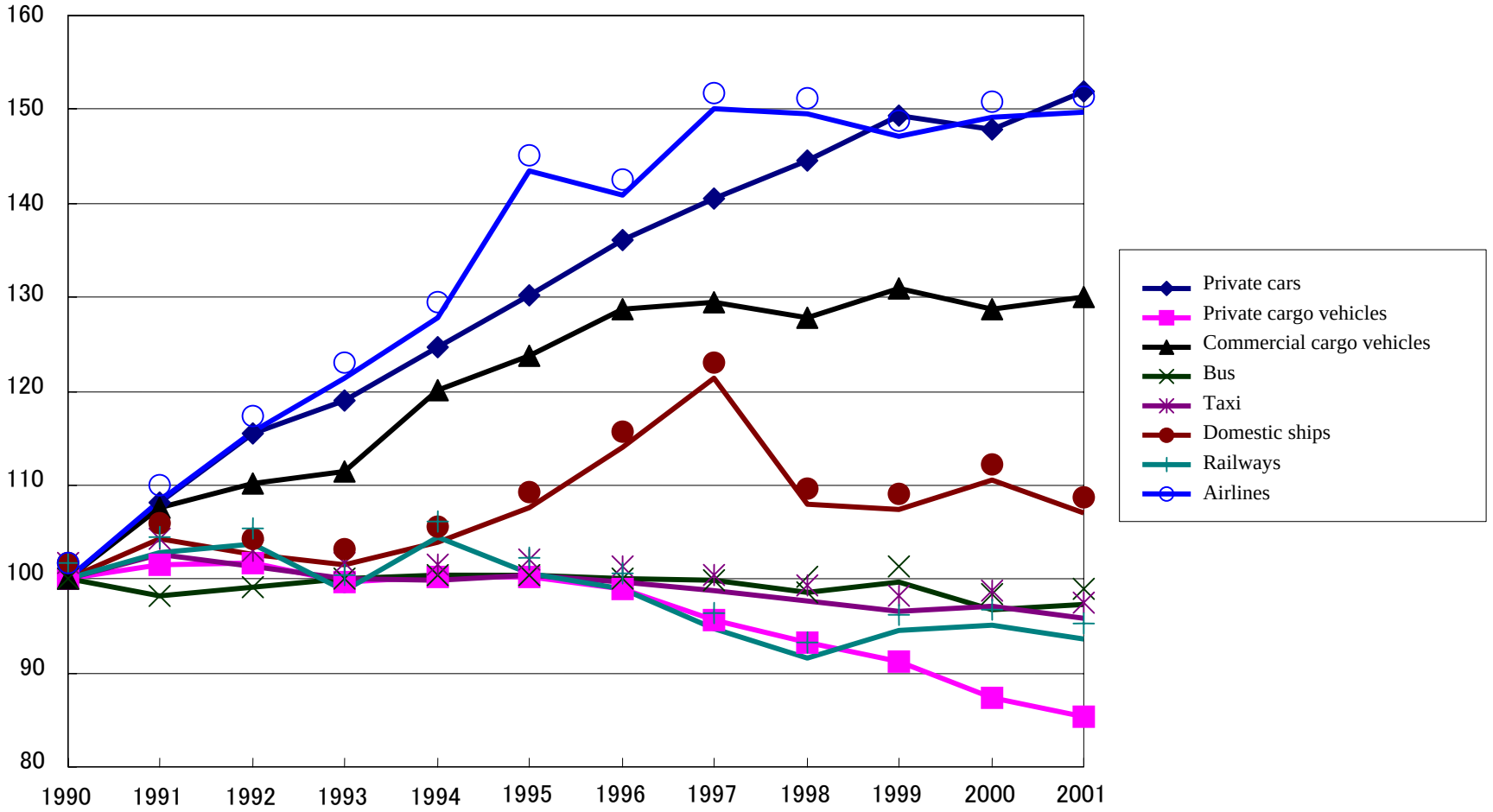


Fig. 4 Transitions in CO_2 Emission Levels, Transport Volume, Driving Mileage of Private Cars (FY1990 ratio)

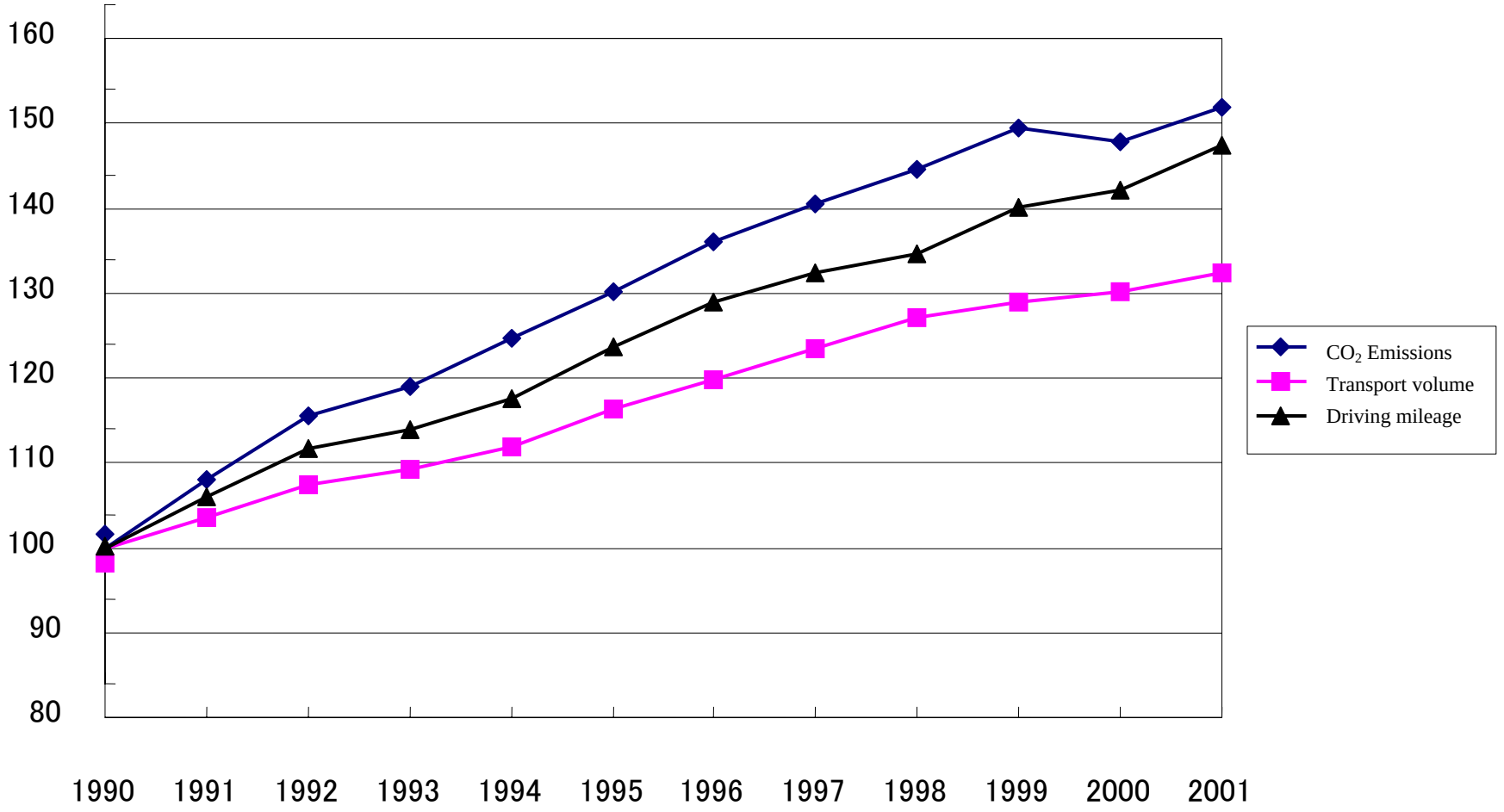


Fig. 5 CO_2 Emissions Level Per Driving Mileage Unit of Private Cars (g-CO_2/km)

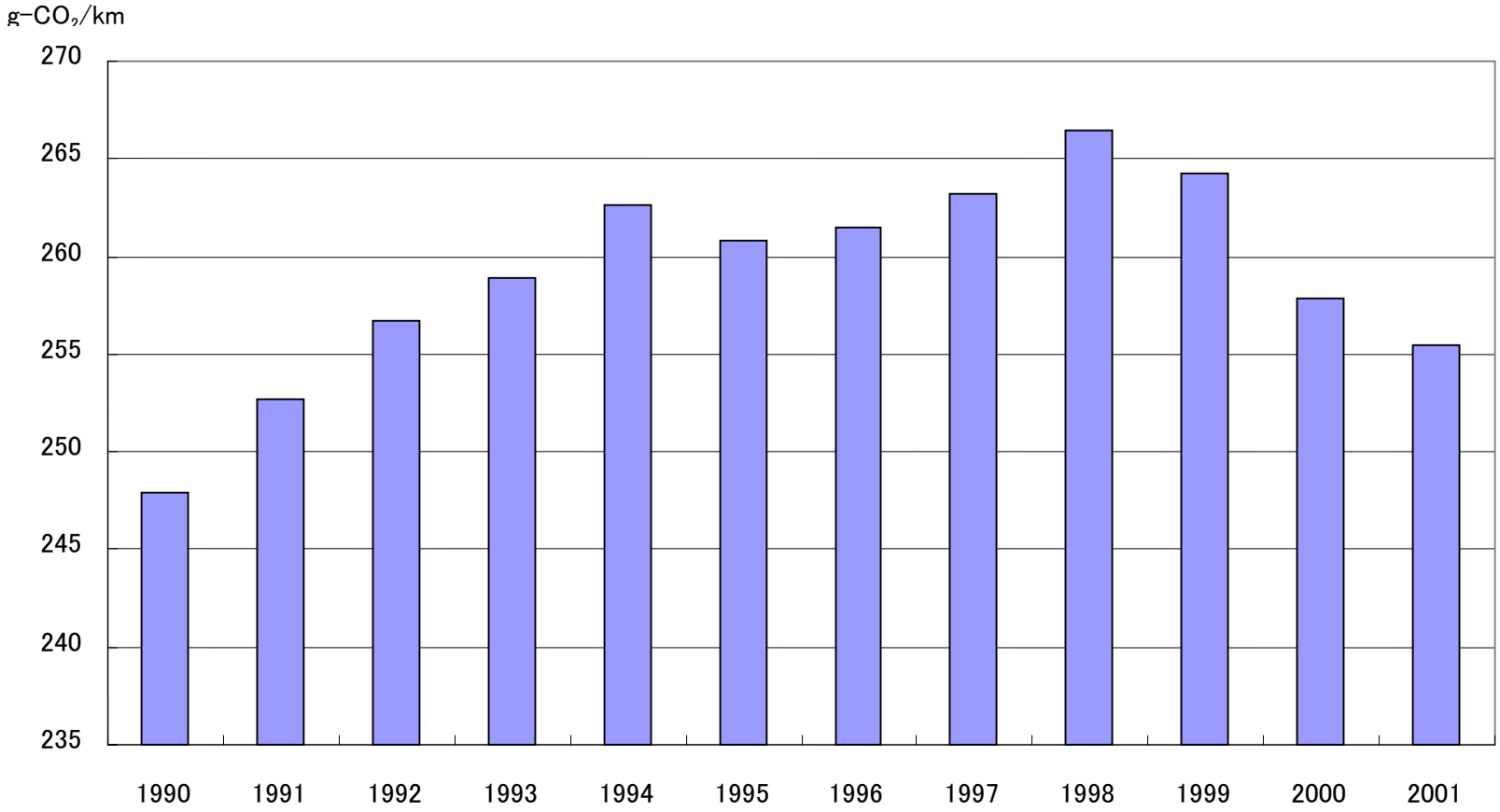


Fig. 6 Transitions in the Number of Passengers Per Private Car (passenger/car)

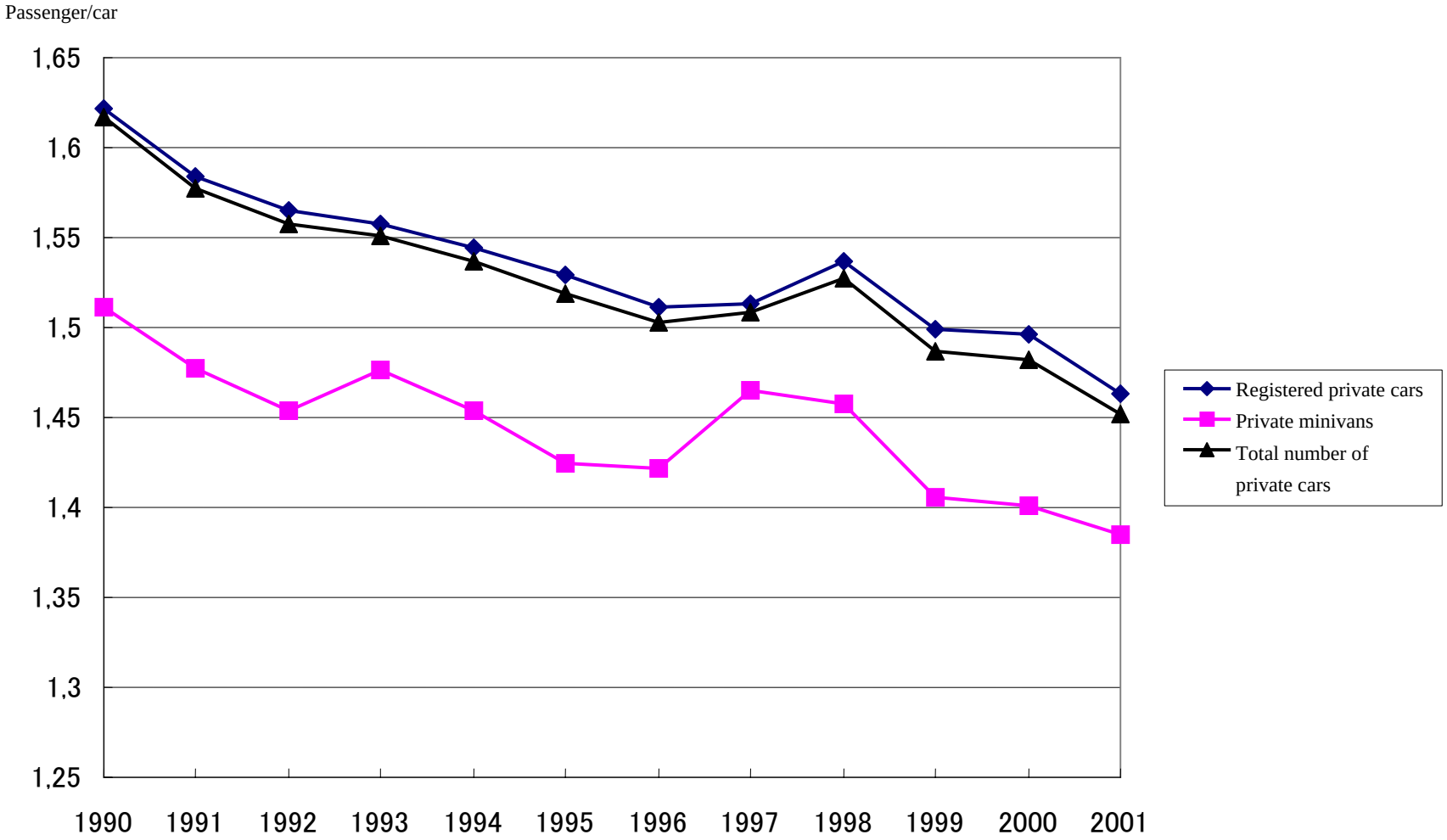


Fig. 7 Transport Volume and CO_2 Emissions of Air, Railway, Ship, Bus, Taxi Transportation

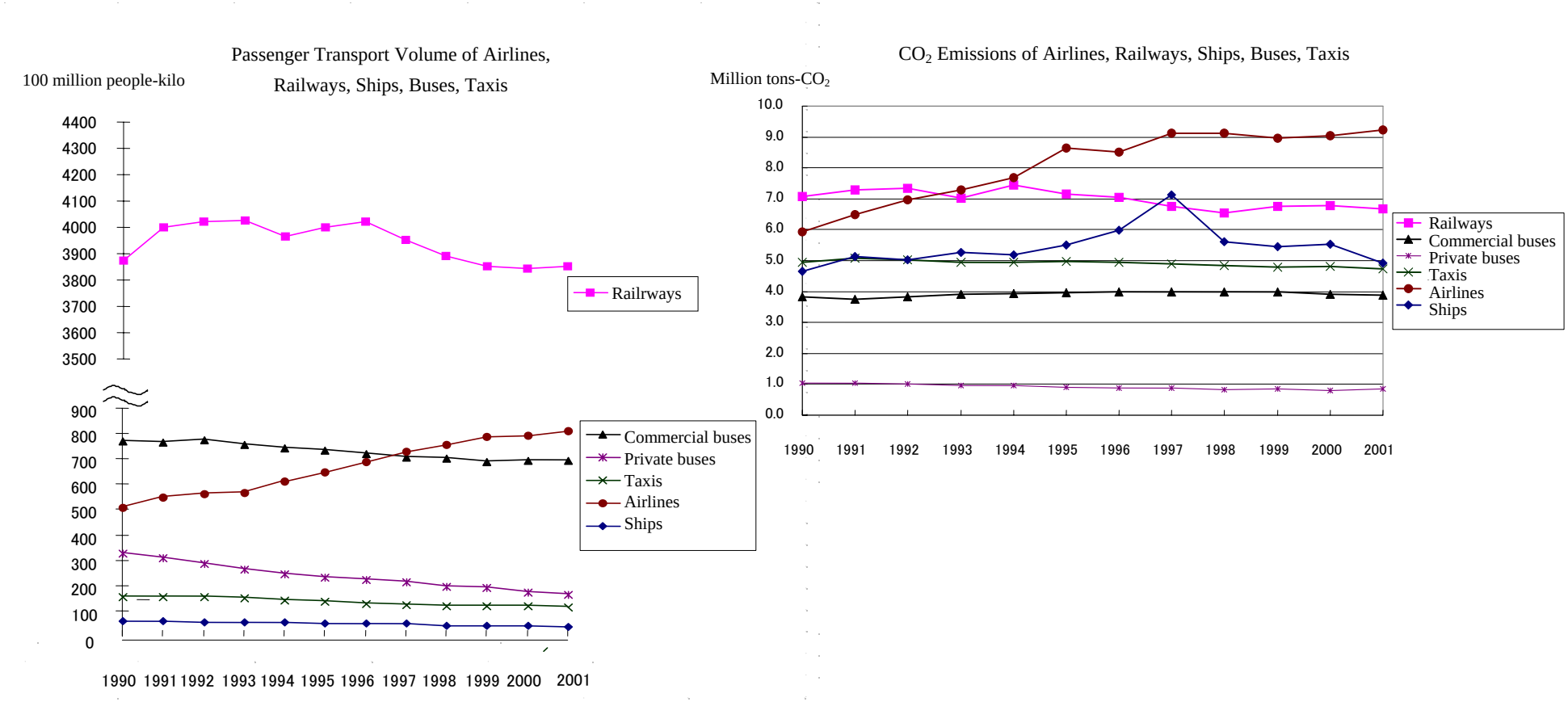
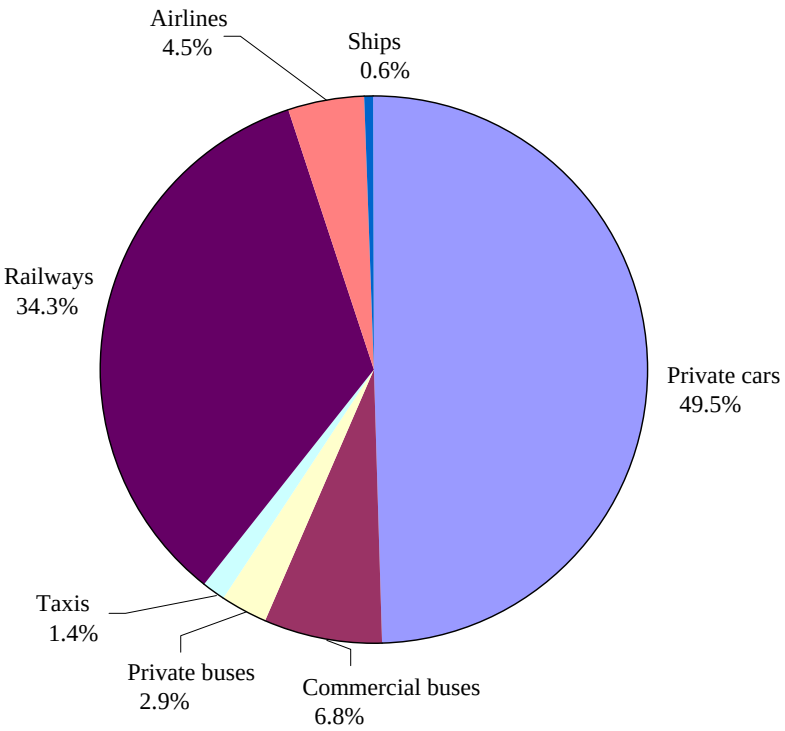
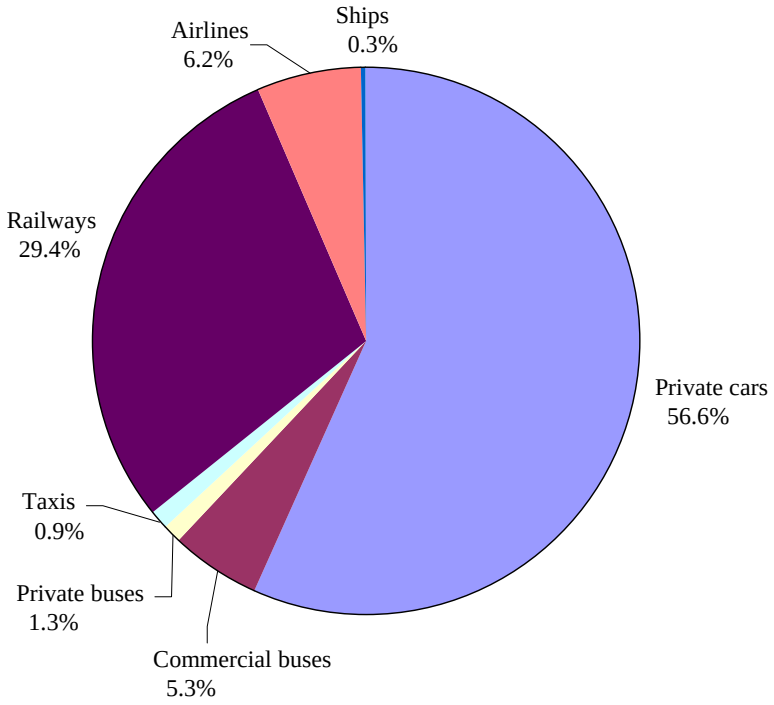


Fig. 8 Transport Volume Share of the Passenger Sector in FY1990 and FY2001 (person-kilo)



FY1990



FY2001

Fig. 9 Transition in CO_2 Emissions, Transport Volume, Driving Mileage of Trucks (FY1990)

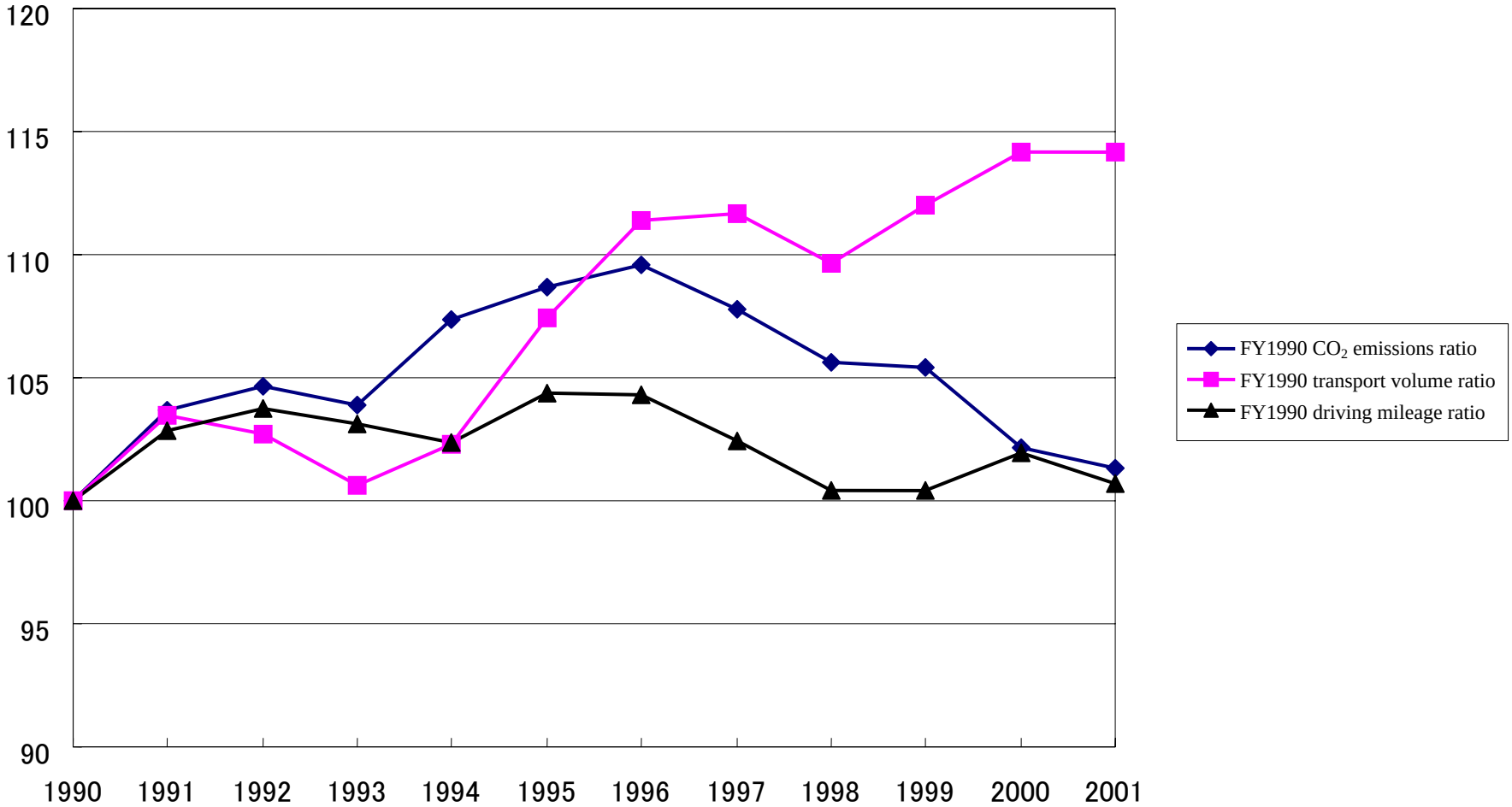


Fig. 10 Cargo Transport Volume Per One Truck (ton/truck)

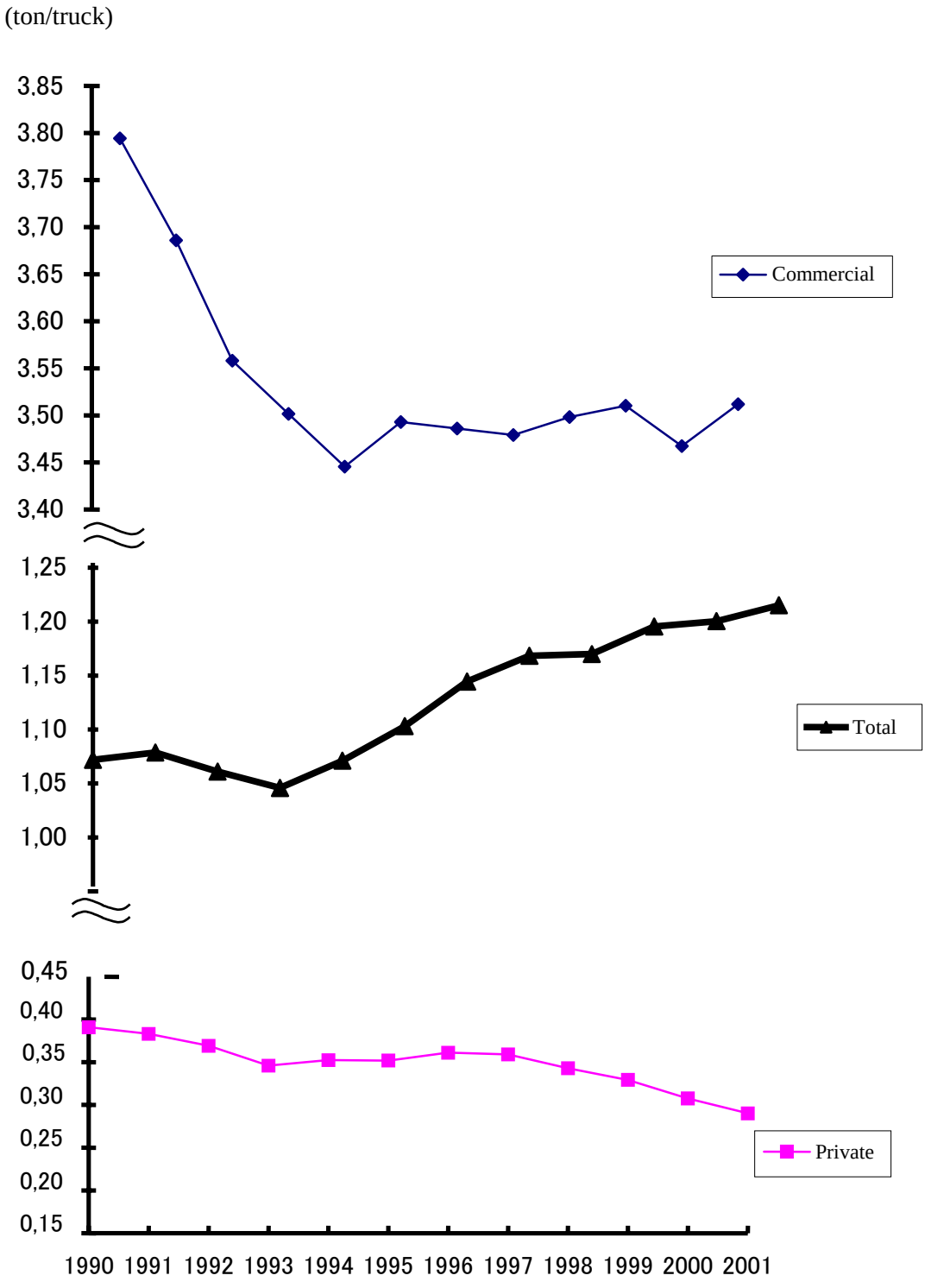


Fig. 11 Switch Between Private and Commercial Truck Transport

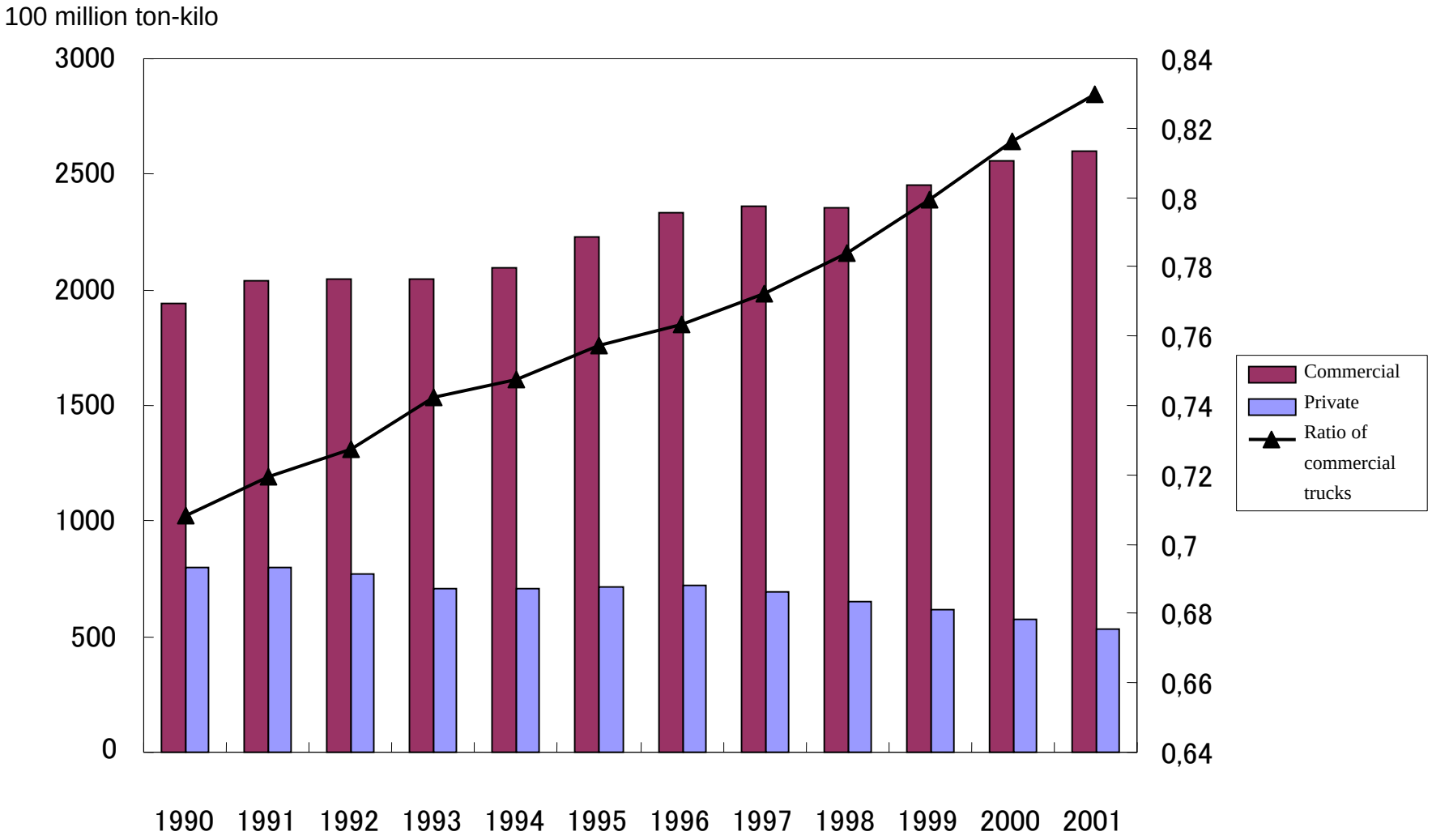


Fig. 12 Average Maximum Freight Volume and Average Freight Volume of Commercial Trucks

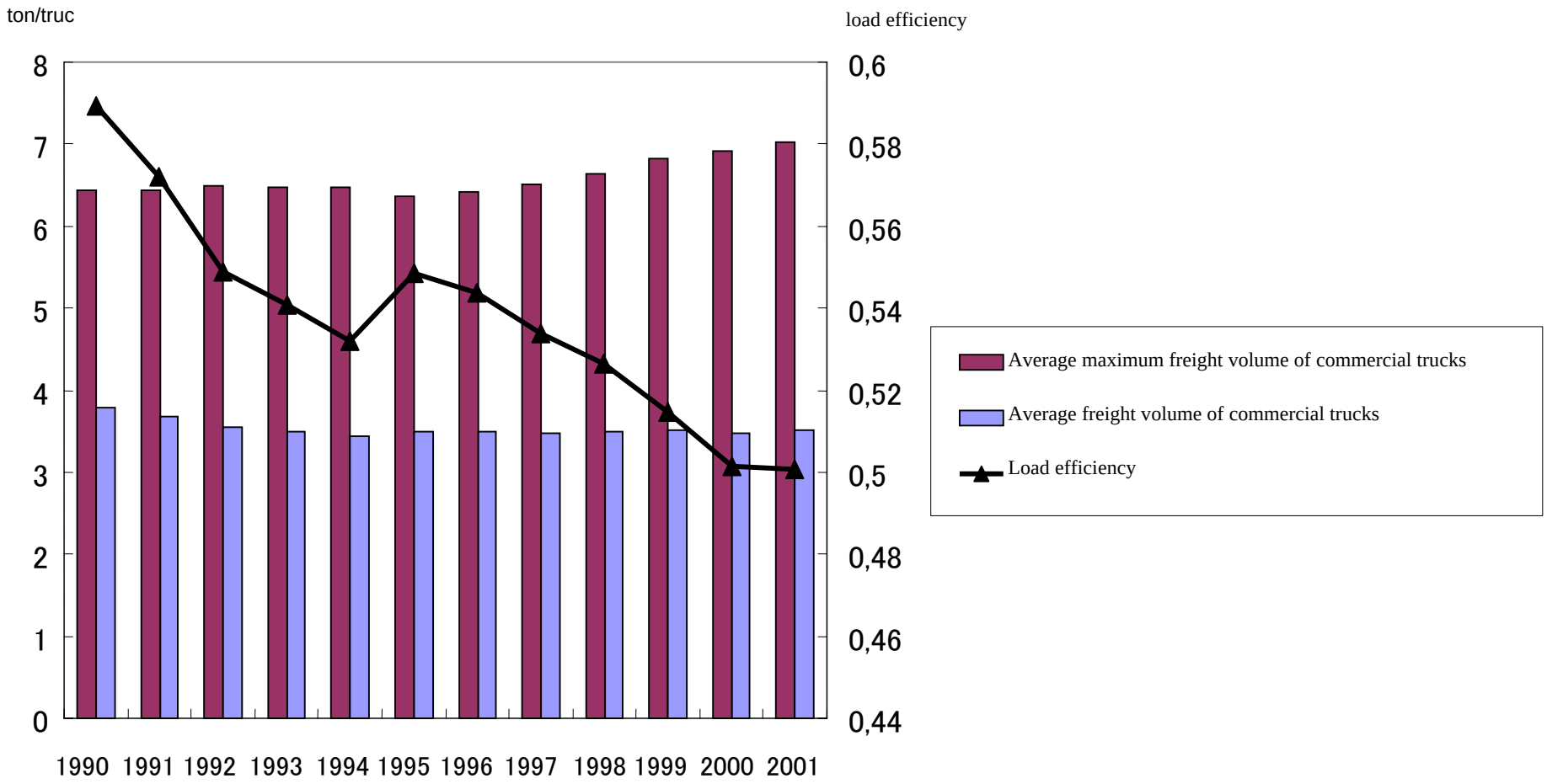
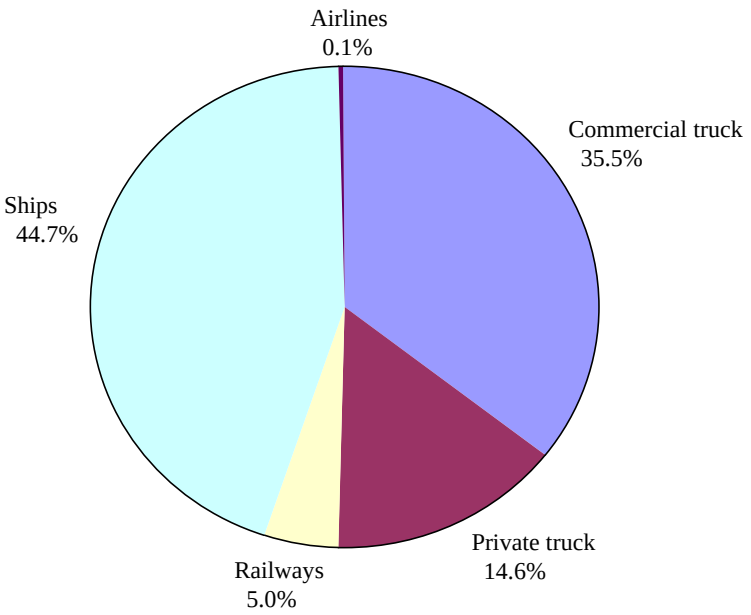
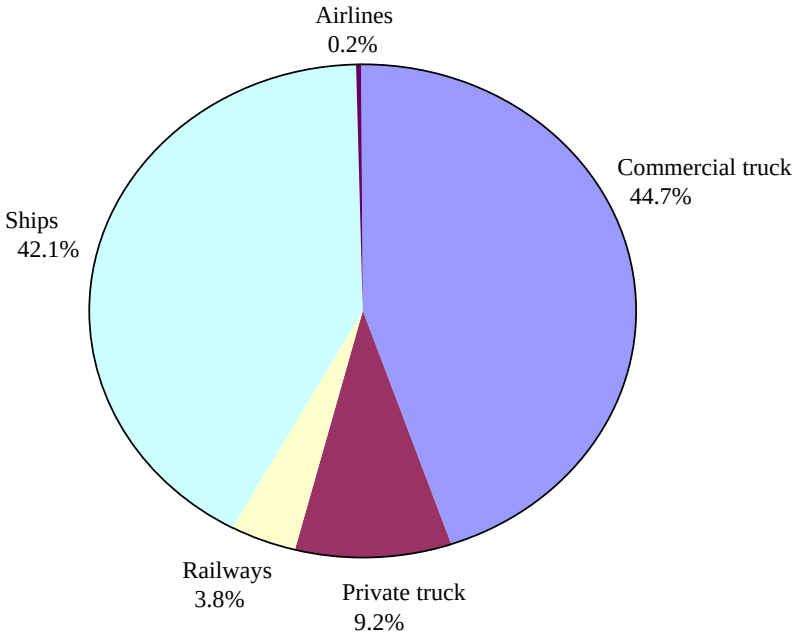


Fig. 13 Transport Volume Share (ton-kilo) of the Cargo Sector in FY1990 and FY2001



FY1990



FY2001

Fig. 14 Transitions in the Share of Cargo Transport Volume in Domestic Shipping

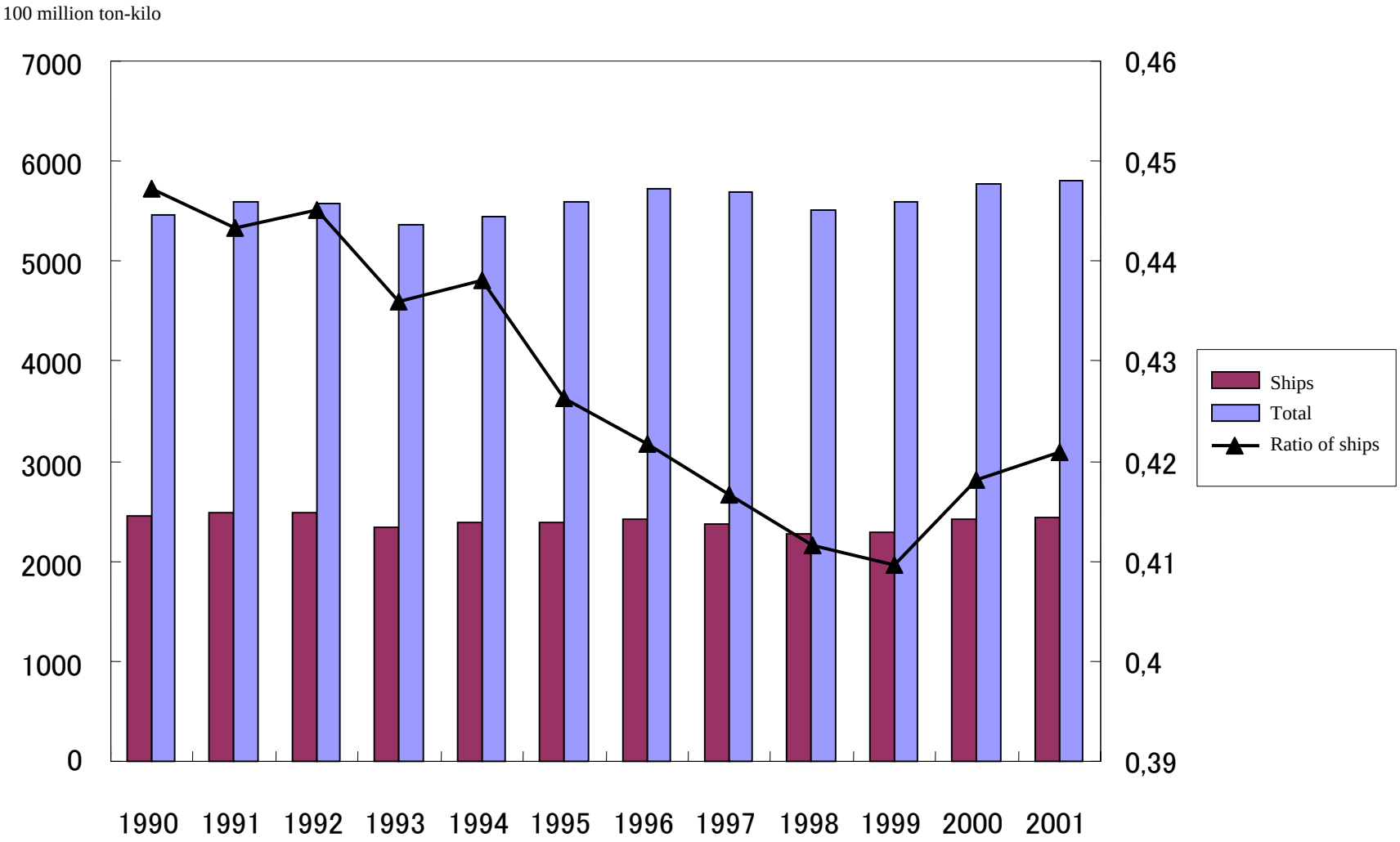


Fig. 15 Transitions in the Share of Cargo Transport Volume for Railway Transport